PATENT. SPECIFICATION

(11)1381571

(21) Application No. 21268/73 (22) Filed 4 May 1973 (31) Convention Application No. 2221811 (32) Filed 4 May 1972

(31) Convention Application No. 2232525

(32) Filed 3 July 1972 in

(33) Germany (DT)

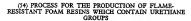
(44) Complete Specification published 22 Jan. 1975

(51) INT CL2 C08G 18/14

(52) Index at acceptance

C3R 32B1B 32B2A1 32B3B 32C10 32C12 32C13P 32C23 32D16D 32D6A 32D6C 32D6G 32D6H 32D6J 32D6K 32EH 32EEA 32EEB 32EEY 32EH 32EB 32G1X 32G1Y 32G3D 32G3X 32H10 32H1 32H3 32H6C 32H6Y 32H9A 32J10 32J12 32J12 32J2C 32JEB 32JEP 32J2Y 32J9A 32J9B 32J9H 32J9X 32KG 32L1B 32L4C 32P5A2 32P5AY

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(71) We, BAYER AKTIENGESELLSCHAFT a body corporate organised under the laws of Germany of 509 Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following

Urethane group-containing foam resins obtained by reacting polyisocyanates with polyols which contain active hydrogen atoms are widely used, e.g. in the field of in-sulation, for the manufacture of structural elements or for upholster padding. The possible applications of polyunethane foams are, however, restricted by their inflam-mability at high temperatures and/or in the presence of fire.

10 It is known to produce urethane group-containing foam resins which have flame resistant properties from compounds which contain active hydrogen atoms, preferably

polyols, polyisocyanates, water and/or other blowing agents in the presence of emulsi-fiers, auxiliary agents and catalysts as well as flame retarding additives. The function 15 of the emulsifiers and stabilizers in the reaction mixture is to homogenize the reactants and, at the same time, to facilitate the foaming process and prevent collapse of the foam after the cessation of gas formation. The catalysts are intended to ensure that the processes taking place during formation of the foam are brought into the required equilibrium and take place at the correct velocity. A certain non-inflammability can be achieved by first adding to the starting components foaming agents which reduce the fiammability of the foam. Substances which have been used for rendering foams non-flammable are compounds of phosphorus, halogens, antimony, bismuth and boron and, also, to a certain extent, nitrogen compounds. Flame-retarding addi-

tives may be subdivided into those which are built into the foam structure by their functional groups and those which, due to the absence of such groups, are merely tractional groups and those winds, user to the assented state groups are meterly loosely incorporated and act more as plasticizers or fillers (see Chapter 2, 3 and 10 "Plammhemmende Substanzen", Kunststoff-Handbuch, Vieweg-Höchtlen Volume XII, Polyurethane, Carl Hanser-Verlag, Munich, 1969).

The introduction of such flame retarding compounds into urethane-group-containing resins which have a low density and large surface area frequently results in a loss of desirable physical properties such as high tensile strength, shape permanence, stretchability and bearing capacity and therefore restricts the application of such foams. For example, although the introduction of a hygroscopic fainer-retarding additional forms of the properties of the prope tive to a polyurethane foam reduces its flammability, it also increases its moisture 35 absorption and therefore results in poor age-resistance properties. The application of flame-retarding additives may also result in a steep increase in internal cell structures, formation of coarse cell structure, and/or collapse of the foam. Effective fireproofing of polyurethane foams, in contrast to the fire-proofing of compact poly-





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urethanes, is difficult because the desired distribution of the additive at the gas/solid interfaces is impossible to achieve owing to the composition of the foaming mixture. It should also be pointed out here that the effective fireproofing of a polyurethane foam is not a simple function of the addition of various fireproofing agents.

Flame-resistant urethane group-containing foam resins with the desired physical properties may be produced e.g. from polyethers which contain active hydrogen atoms and in which at least 10% of the hydroxyl groups present are primary hydroxyl groups and which have a molecular weight of e.g. 750 to 10,000, preferably 4000 to 8000, and special polyisocyanates.

The special polyisocyanates required for this purpose are for example the socalled modified polyisocyanates, e.g. solutions of polyisocyanates which contain biuret groups in polyisocyanates which are free from biuret groups and/or solutions of polyisocyanates which contain at least two NCO groups and at least one N,N'-disubstituted allophanic acid ester group in polyisocyanates which are free from allophanic acid

ester groups and/or solutions of reaction products of diisocyanates and divalent or higher-valent compounds which contain hydroxyl groups in polyisocyanates which are free from urethane groups and/or solutions of polyisocyanates which contain more than one NCO group and at least one isocyanuric acid ring in polyisocyanates which are free from isocyanurate groups. High flame resistance in foam resins which contain urethane groups means that they are graded as self-extinguishing according to ASTM Method D 1692-67 T.

Flame-resistant urethane group-containing foam resins with the desired physical properties which have been produced e.g. using the modified polyisocyanates have the disadvantage of having faults in the form of bubbles under the surface of the foam, which may also extend to the interior of the foam. These faults occur especially in moulded foam products produced by the process of foaming in the mould and they are a very serious disadvantage, e.g. in the manufacture of moulded parts used for the furniture industry or motor car industry because these bubbles are very clearly visible through fine quality covering materials.

It has been found that attempts to overcome this defect by using commercial polysiloxane-polyalkylene oxide copolymers do not give the desired result because the addition of even a small quantity of stabilizer results in irreversible shrinkage of the foam so that the foam becomes unusable.

According to the invention, a process for the production of non-shrinking flameresistant foam resins which contain urethane groups has been found which is based on the use of certain siloxanes for preventing the undesirable formation of bubbles in the interior of the foam and under the surface.

This invention thus relates to a process for the production of non-flammable, non-shrinking open-celled foam resins which contain urethane groups from polyethers which contain active hydrogen atoms and preferably have a molecular weight of 750 to 10,000, polyisocyanates, water and/or organic blowing agents in the presence of silicon compounds, in which the silicon compounds are siloxanes of the following general formula

$$R_3 - SiO - \begin{bmatrix} R' \\ -Si - O - \\ O \\ SiR_3 \end{bmatrix} = Si - R_3$$

- preferably used in quantities of 0.1 to 25% by weight, more preferably 0.20 to 5% by weight, based on the weight of polyisocyanate and of polyether. In the above formula, R represents an aliphatic hydrocarbon radical preferably containing less than 3 carbon atoms, preferably methyl, R' represents a monovalent aromatic radical, preferably phenyl, and a represents values of from 0 to 3; at least 70% by weight of the siloxane mixture consisting of siloxanes in which $\alpha=1$ and siloxanes in which a=0 and a=2 or a=3 are present in the mixture in proportions of not more than 25% by weight, 20% by weight and 5% by weight, respectively. The following technical advantages have surprisingly been found.
 - 1. The siloxanes used according to the invention are substances which can be

	thoroughly and rapidly mixed with the polyethers mentioned above and the other foam components. Rapid and vigorous mixing of the components brings considerable advantages, namely the fluidity of the reaction mixture and the formation of nuclei	
5	during the feaming process are greatly promoted, factors which are the precondition for optimum manufacturing results in the production of feams by a moulding process	. 5
	involving long flow paths or widely varying cross-sections, and, moreover, the stability of the reaction mixture is improved and, after completion of the foaming process, a fine cell structure is obtained right up to the surface of the foam in cases where foams	
10	are produced by a moulding process. 2. Highly clastic mouldings with an exceptionally good handle can be obtained	10
	using the conventional foaming conditions and foam formulations, which means that the compression characteristic is advantageously improved. 3. The siloxanes used according to the invention do not impair the efficiency of	
15	agents used for obtaining an open cell structure, which agents may be either lossely incorporated or built in chemically and can be uniformly distributed throughout the whole substance.	15
20	4. When used in the conventional fourn formulations under conventional operating conditions, siloranes according to the invention result in foams with a high flame resistance, which means that according to ASTM D 1692-67 T they are graded as self-extinguishing and in this respect they differ from the polyulioxane-polyuliylene oxide copolymers conventionally used which result in foams which are assessed as flammable according to ASTM D 1692-67.	20
	The starting components used for carrying out the process according to the inven- tion may be known aliphatic, cycloaliphatic, araliphatic or aromatic polyisocyanates,	
25	for example tetramethylene-1,4-diisocyanate; bexamethylene - 1,6 - diisocyanate; dodecane-1,12-diisocyanate; cyclohexane-1,3- and -1,4-diisocyanate and any mixtures of these isomers; 1 - isocyanato - 3,3,5 - trimethyl - 5 - isocyanatomethyl - cyclo-	25
30	hexane; phenylene - 1,3 - and - 1,4 - diisocyanate; tolylene - 2,4 - and - 2,6 - diisocyanate and any mixtures of these isomers; hexahydrotolylene-2,4- and -2,6-diiso-	
50	cyanate and any mixtures of these isomers; diphenylmethane-4,4'-diisocyanate; naph- thylene-1,5-diisocyanate; triphenylmethane-4,4',4''-triisocyanate; polyphenyl-poly- methylene polyisocyanates produced by the phosgenation of aniline-formaldehyde con-	30
35	densation products; polyisocyanates containing carbodiimide-isocyanate adducts ob- nained according to German Patent Specification No. 1,092,007; the diisocyanates described in U.S. Patent Specification No. 3,492,330; polyisocyanates containing allophanate groups as described in British Patent Specification No. 994,890; Belgian Patent Specification No. 761,626 and published Dutch Patent Application No.	35
40	7,102,524; polyisocyanates with isocyanutate groups as described in German Patent Specifications Nos. 1,022,789 and 1,027,394 and in German Offenlegungsschriften Nos. 1,929,034 and 2,004,048; polyisocyanates containing birret groups as described	. 40
	m German Patent Specification No. 1,101,394; British Patent Specification No. 389,050 and French Patent Specification No. 7,017,514; polyisocynamics prepared by telomerisation reactions as described in Belgian Patent Specification No. 73,3640:	- 20
45	polyisocyanates containing ester groups in accordance with British Patent Specifica- tions Nos. 956,474 and 1,072,956; aliphatic, cycloaliphatic, araliphatic or aromatic polyisocyanates mentioned by W. Siefgen in Justus Liebig's Annalen der Chemie, 562, pages 75 to 136; reaction products of the above mentioned isocyanates with acetals in	45
	accordance with German Patent Specification No. 1,072,385 and the isocyanates mentioned in German Patent Specifications Nos. 1,022,789 and 1,027,394.	•
50	Any mixtures of the above mentioned polyisocyanates may, of course, also be used. It is generally preferred to use commercially readily available polyisocyanates,	. 50
	e.g. tolylene-2,4- and -2,6-diisocyanate and any mixtures of these isomers as well as polyphenyl-polymethylene-polyisocyanate which may be produced by the phosgenation	
55	of aniline-formaldehyde condensation products. According to the invention, it is also preferred to use polyisocyanates which are solutions of so-called modified polyisocyanates, i.e. solutions of polyisocyanates con-	. 55
60	taining biuret, allophanate, urethane or isocyanurate groups in polyisocyanates which are free from such groups. Preparation of these modified polyisocyanates is known per se. The solutions of modified polyisocyanates which are preferred for the inven-	
	tion generally contain 5 to 85% by weight and preferably 10 to 50% by weight of modified polyisocyanate. The unmodified polyisocyanates used are mainly tolylene-2,4-and/or -2,6-diisocyanate, which may be mixed with diphenyl-methane-4,4'-diiso-	60
65	cyanate and its isomers. Preparation of allophanate polyisocyanates may be carried out e.g. according to	65

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Belgian Patent Specification No. 763,529, preferably using diisocyanates such as tolylene-2,4-diisocyanate or mixtures thereof with tolylene-2,6-diisocyanate. The poly4

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tolytine-grainst-pained in Indiana instead with impartmental paintment in incomment solutions used according to the invention generally contain 5 to 85% by weight, more preferably 10 to 95% by weight, of allophanate polyisocyanate. The modified polyisocyanates used according to the invention may also be solutions.

The monineu polysocyanates which contain hitter groups in polysocyanates which are free from binare groups. It is preferred to use 5 to 83% by weight solutions of bitues groups, and an are solutions of bitues groups.

in which R represents a preferably C_1 to C_{1e} alkylene radical, preferably C_2 to C_{1e} ocycloalkylene radical, preferably C_4 to C_{1e} aralkylene radical or preferably C_6 to C_{1e} arylene radical and X represents hydrogen or the group 10

in which R has the meaning specified above and n represents 0 or an integer prefer-15 ably 0 or an integer of from 1 to 5 in polyisocyanates which are free from binret groups, the proportion of binret polyisocyanates which contain more than 3 isocyanates groups, based on the total quantity of polybiuret isocyanates, preferably being at least 20% by weight. Preparation of polyisocyanates which contain biuret groups may be carried out e.g. according to British Patent Specification No. 889,050 or German 20

Patent Specification No. 1,101,394. Preferred polyisocyanates according to the invention are solutions of biuret polyisocyanates which have been prepared by reacting tolylene-2,4- and/or -2,6-diisocyanate, diphenyl methane-4,4'-diisocyanate and/or its isomers or a polyisocyanate mixture produced by the phosgenation of aniline-formaldehyde condensation products with water or formic acid in polyisocyanates which are

in the front must be polysocyanias such as the polysocyanias such as t polyisocyanate by reaction with the isocyanate groups in accordance with German Offenlegungsschrift No. 1,963,189

The isocyanate components used as starting material according to the invention may also be polyisocyanates which contain urethane group-containing polyisocyanates and which may be more highly branched than pure difunctional isocyanates. The isocyanates used according to the invention preferably contain 5 to 85%, more preferably 10 to 50%, of urethane group-containing isocyanates dissolved in polyiso-

35 cyanates which are free from urethane groups. Modified polyisocyanates prefcrably used as starting material may also be solutions of polyisocyanates which contain at least one isocyanuric acid ring in liquid polyisocyanates which are free from isocyanurate groups. Such isocyanurate groups.

containing polyisocyanates and processes for preparing them have been described e.g. in German Patent Specification No. 951,168 and 1,022,789; British Patent Specificain German Factor Specification No. 251,100 and 1502,675; DILISH FRIENT Specifications No. 3,154,522 and 2,801,244; French Patent Specification No. 3,154,522 and 2,801,244; French Patent Specification No. 1,510,342 and Belgian Patent Specification No. 718,994. The polyisocyanates which 45 contain at least one isocyanuric acid ring are preferably polymeric tolylene diisocyanates, 2,4- or 2,6-isomers or any mixtures of these isomers, which may be mixed with 4,4'-diphenylmethane-diisocyanate or its isomers. The isocyanates used according

to the invention are obtained by dissolving the polyisocyanate which contains iso-cyanurate groups, generally in quantities of 5 to 85% by weight based on the weight of the resulting polyisocyanate solutions, in the liquid polyisocyanates which are free from isocyanurate groups.

The polyisocyanates which are free from urethane groups, allophanate groups, isocyanurate, groups or biuret groups may be aliphatic, cycloaliphatic, aromatic or

•	araliphatic polyisocyanates, e.g. those described in Liebigs Annalen der Chemie, Volume 562 (1949), page 775 et seq. It is preferred to use tolylene-2,4- and/or -2,6-diisocyanate or undistilled crude mixtures of these isomers, diphenyl-methane-	
5	4.4" and/or -2.4"-diisocyanate or the undistilled crude mixtures, naphthalene-1,5-diisocyanate, reiphenyl-methane-4/4". "Intersoperate, 1-5 isocyanato -3,5.5 trimethyl -5 isocyanatomethyl - cyclohexane, polyphenyl-polymethylene polyisocyanate produced by the phosgenation of the condensation produces of aniline and/or allyl-substituted anilines with formaldehyde or isocyanates which contain carbodimidelines.	5
10	isocyanate adducts as described e.g. in German Patent Specification No. 1,092,007. Monofunctional isocyanates such as propylisocyanate, cycloberylisocyanate, phenylisocyanate, tolylisocyanates or p-chlorophenylisocyanate may also be included but they should not amount to more than 20% of the isocyanate combination used according to the invention, based on the total isocyanate content. Polyethers which contain at least two active hydrogen atoms and generally have	16
15	a molecular weight of 750 to 10,000 and in which preferably at least 10% of the hydroxyl groups present are primary OH groups are also used as starting material for the process of the invention. These polyethers may be obtained e.g. by reacting compounds which contain reactive hydrogen atoms, e.g. polyalcohols, with alkylene oxides such as ethylene oxide, propylene oxide, but yher oxide, styrene oxide or epi-	15
20	chlorohydrin, which may be followed by modification of the resulting polyethers with ethylene oxide. Suitable polyalcohols and phenols are e.g. ethylene glycol, diethylene glycol, poly-	20
25	ethylene glycol, propane-1,2-diol, propane-1,3-diol, butane-1,4-diol, betane-1,6-diol, decane-1,10-diol, butyne-2-diol-1,4-glycorol, butane-2,4-diol, hexane-1,3,6-triol, trimethylopropane, resorcinol, di-tert-buyl-pyrocatechol, 3-hydroxy-2-naphthol, 6,7-dhydroxy-1-naphthol, 2,7-dhydroxy-phenyl)-propane, 4-(p-hydroxyphenyl)-methane, tris-(hydroxyphenyl)-glakane such as tri-(hydroxyphenyl)-propane. Other suitable polysters are: Adducts of	25
30	1,2-altylene oxides with aliphatic or aromatic monoamines or polyamines, e.g. ammonia, methylamine, ethylene diamine, terta or hera-methylene diamine, diethylene triamine, ethanolamine, diethylene triamine, ethanolamine, diethanolamine, methyl-diethanolamine, triethanolamine, aminoethylpiperazine, toluidine, orto-, meta- and para-phenylene diamine, 2,4- and 2,6-diaminotolome, 2,6-diamino-p-xylene, multi-nuclear and condensed aromatic poly-	30
35	amines such as 1,4-naphthylene-diamine and 4,4'-diamino-azobenzene. Resinous materials of the phenol or resol type may also be used as starting materials. All these polyethers are preferably prepared with the addition of ethylene oxide. They may also be modified by reaction with less than equivalent quantities of polyisocymate.	35
10	The higher molecular weight polyethers used according to the invention may also be used in admixture with low molecular weight compounds (molecular weight up to 750) which contain active hydrogen atoms or in admixture (up to 50% by weight based on the polyether) with other higher molecular weight compounds which contain active hydrogen atoms. Suitable low molecular weight compounds with active hydrogen atoms. Suitable low molecular weight compounds with active hydrogen atoms are mainly compounds which contain hydroxyl groups, e.g. ethylene	40
15	glycol, 1,3-butylene glycol, 1,4-butylene glycol, glycerol, trimethylolpropane, castor oil or adducts (molecular weight generally 200 to 750) of alkylene oxides such as ethylene oxide, propylene oxide or butylene oxide with such low molecular weight compounds which contain active hydrogen atoms or with water. Other suitable hieler	45
i0	molecular weight compounds with active hydrogen atoms are known compounds such as polyseters, polyacetals, polyseter amides or polycarbonates. These may be used in proportions of up to 50% by weight, based on the polyether. The self-extinguishing polyurethane foams may be produced either by the pre-	50
55	polymer process or, preferably, by the known one-shot process. In the one-shot pro- cess, the foam is produced at room temperature and/or elevated temperature by simply mixing the polyisocyanates with the polyethers, using water and/or other blow- ing agents, to which emulsifiers and other auxiliary agents as well as the siloxanes according to the invention may also be added. Mechanical devices are advantageously used for this purpose, e.g. those described in French Patent Specification No. 1047-713.	55
50	Suitable emulsifiers are e.g. adducts of ethylene oxide and/or propylene oxide with hydrophobic substances which contain hydroxyl, amino or amilo groups. Suitable catalysts for producing foam resins which contain urchane groups are e.g. tertiary amines and/or silaamines, N-substituted aziridines, or hexahydrotrazines, which may be used in combination with organometalic compounds. Whereas amines preferentially	60
55	catalyse the blowing reaction, organometallic compounds preferentially catalyse the	65

	cross-linking reaction. To achieve reaction times which are advantageous for the foam- ing technique, the most suitable quantity of catalyst is determined empirically accord- ing to the constitution of the selected catalyst or catalyst mixture. The amines used	
5	may be those commonly used for the production of polyurethan feams, for example dimetalyheasyalmine, N-methylmorpholine, triethylenediamine, dimethylipsiperazine, 1,2-dimethylimidazole, dimethylentanolamine, diethanolamine, triethanolamine, diethylaminothylminothyl-mino- ethylaminothyl-mino	5
10	c.g. as described in German Patent Specification No. 1,229,290. 2,24-Timethyl-2- silamorpholine and 1,3-diethyl-aminomethyl-tetramethyldisloxane are mentioned here as examples but nitrogen-containing bases such as tetralalylammonium hydroxides as well as alkalis, alkali metal phenolates or alcoholates, e.g. sodium methylate, may be used. The organic metal compounds which may be used in combination with amines,	10
15	silaamines and hexahydrotriazines in accordance with German Offenlegungsschrift No. 1,769,043 are preferably organic tin compounds, e.g. tin(II) octoate or dibutyl tin dilaurate. Additives for regulating the cell structure, such as organic or inorganic fillers, dyes or plasticizers such as phthalic acid esters may also be used.	15
20	Foaming is preferably carried out in moulds, the reaction mixture being intro- duced into a mould. The material of which the mould is made may be of metal, e.g. aluminium, or a synthetic resin, e.g. epoxy resin. The foamable reaction mixture foams up in the mould and forms the moulded product. Foaming in the mould may be carried out in such a manner that the moulded product has a cell structure on its	20
25	surface but it may also be carried out to produce a moulded product with a compact skin and cellular core. According to the invention, this is achieved by introducing so much foamable reaction mixture into the mould that the resulting foam just fills the mould. Alternatively, a larger quantity of foamable reaction mixture than is required for filling the interior of the mould with foam may be introduced. This method is	25
30	known as "overcharging". It has already been disclosed, e.g. in U.S. Patent Specification No. 1,178,490 and 3,182,104. Blowing a gents in many cases already known per se are used for foaming in the mould. According to the invention, the products produced are in particular cold harden-	30
35	ing foams (see British Patent Specification No. 1,162,517 and German Offenlegungs- schrift No. 2,153,086). The silicones used according to the invention are known per se and may be prepared e.g. by the process according to German Patent Specification No. 1,046,049 or according to U.S. Patent Specification No. 3,012,052.	35
40	The foam resins according to the invention may be used for known applications, e.g. in the field of upholstery. The invention will now be further described in the following specific examples in which parts and percentages are in all cases parts and percentages by weight unless otherwise specified.	40
45	The siloxanes used according to the invention are those which can be easily prepared as described in German Patent Specification No. 1,046,049. The siloxanes used in the following examples correspond to the formula on page 4 in which R=methyl and R'=phenyl and they have the following compositions:	45
50	83.5 Parts by weight of the above mentioned formula in which a=1 14.5 parts by weight of the above mentioned formula in which a=2 2.0 parts by weight of the above mentioned formula in which a=3. Siloxane 2:	50
55	15.0 Parts by weight of the above mentioned formula in which a=0 71.0 parts by weight of the above mentioned formula in which a=1 12.3 parts by weight of the above mentioned formula in which a=2 1.7 parts by weight of the above mentioned formula in which a=3. Siloxane 3:	55
60	25.0 Parts by weight of the above mentioned formula in which a=0 74.0 parts by weight of the above mentioned formula in which a=1 1.0 part by weight of the above mentioned formula in which a=2.	60

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Example 1

A) Preparation of the polyisocyanate 20 Parts of 1,2-propylene glycol were added to a mixture of 225 parts of a mixture of 80% by weight of tolylene-2,4-diisocyanate and 20% by weight of tolylene-5 2,6-diisocyanate and 274 parts by weight of diphenylmethane-4,4'-diisocyanate at 60°C, and the mixture was reacted for 30 minutes. After the addition of 1 part of β-phenyl-ethyl-ethyleneimine, the reaction mixture was heated to 130°C. Trimerisa-3-peneryl-emyl-emylenening, the reaction mixture was meater to 130 C. Limitaria-tion which took place at this temperature was stopped after 2½ hours, when the NCO content of the reaction mixture was 26.5%, by adding 1 part of methyl p-toluen-sulphonate. After dilution with 624 parts of an 80/20 mixture of tolylene-2,4- and 10

sulphonate. Anter dilution with 0.44 parts of an 80/20 mixture or tolylene-2,4- and (%): 38.4, viscosity Cf.₂ ate₆ ci. 24, refractive index n₀. 1. 157.8.

§ 100 Parts by weight of a oplypropylene glycol which had been started on di-propylene glycol and modified with ethylene oxide to result in 60% of primary hydroxyl end groups with OH number 2.8, 3.5 parts by weight of or water, 0.1 part by weight of endoethylene)pienzine, 0.4 part by weight of trichtylamine, and 0.9 parts by weight of tri by weight of siloxane 1 were mixed together and reacted with 47.0 parts by weight of the polyisocyanate mentioned above. A foam which had the following mechanical

properties was obtained:

)	Density	DIN 53420	(kg/m³)	38	20
	Tensile strength	DIN 53571	(kp/cm²)	0.8	
	Elongation at break	DIN 53571	(kp/cm²) (%)	150	
	Compression test	DIN 53577	(p/cm²)	25	
	Flammability according to	ASTM D 1692-67 T	٠, ,		
•	Length of burnt sample/ave	rage value	(cm)	6.0	25
	Average extinction time		(sec.)	35	
	Assessment		Self-extinguis	shing.	

Self-extinguishing. Example 2

A) Preparation of a polyisocyanate

1.33 Parts of 1,2-propylene glycol were added to 27.5 parts of the mixture of tolylene-2,4- and -2,6-diisocyanate mentioned in Example 1 at 60°C and after a reaction time of 30 minutes, during which time the temperature rose to 80°C, 0.044 part of B-phenyl-ethyl-ethyleneimine was added.

Using nitrogen at protective gas, the reaction mixture was then heated to 130°C 35 and trimerisation was stopped after a reaction time of about 5 hours at this temperature, when the NCO value was 25.8%, by adding 0.042 parts of benzoyl chloride. After dilution of the reaction mixture with 71.50 parts of a 65/35 mixture of tolylene-

2,4- and -2,6-diisocyanate, 5.28 parts of 2,3-dibromopropanol were added to this solution and reacted for 2 hours at 80 to 90°C. The modified polyisocvanate solution had the following properties.

NCO content (%): 38.5, viscosity cP_{2g deg C}: 26 and refractive index n_D⁵⁸:

1.5690.

B) 100 Parts by weight of a polypropylene glycol which had been started on di-hydroxydiphenylmethane and modified with ethylene oxide to result in about 60% of primary OH end groups with OH number 28.

3.5 parts by weight of water,

0.1 part by weight of endoethylene piperazine,

1.0 part by weight of N,N-dimethylbenzylamine and 1.0 part by weight of siloxane 1

were mixed together and reacted with 44.0 parts by weight of the polyisocyanate pre--50 pared as described above. A foam resin which had the following mechanical properties was obtained.

	Density	DIN 53420	(kg/m^3)	40
	Tensile strength	DIN 53571	(kp/cm²)	0.7
55	Elongation at break	DIN 53571	(kp/cm²) (%)	160
	Compression test	DIN 53577	(p/cm²)	25
	Flammability according to	ASTM D 1692-67 T	47-7	
	Length of burnt sample/av	erage value	(cm)	3.5
	Average extinction time		(sec.)	25
60	Assessment		Self-extinguis	hing.

0.040 Part of a solution of water in acetone (25 g of water made up to 1000 ml with acetone) and 0.038 part of β -phenyl-ethyl-ethylene-imine were added to 25.0

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A) Preparation of polyisocyanate

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5	parts of the mixture of tolyler at 22°C. After a brief incubat diisocyanate began. It was stop the NCO content was 31% an of methyl p-toluene sulphonate temperature of the reaction m 14 hours.	ne-2,4- and -2,6-diisocyanate tion period, the slightly exoth ped after a reaction time of a d the reaction temperature 70 a. 3 Parts of tripropylene gly	ermic trimerisation of the about 2 to 2½ hours, when 0°C, by adding 0.024 part	10
15		reaction mixture at 90°C. A olyisocyanate combination had	5.42 parts of 2,3-dibromo- fter a reaction time of 2 d an NCO content (%):	15
	B) 100 Parts by weight of a pylene glycol and modified w primary hydroxyl end groups	ith ethylene oxide to result :	had been started on pro- in approximately 60% of	
20	3.2 parts by weight of 0.1 part by weight of 0.4 part by weight of 1.0 part by weight of 1.0 part by weight of 0.4 part by weight of 0.5 parts by	f endoethylenepiperazine, f triethylamine and		20
25	were mixed together and reacti pared as described above. A foam resin which had	ed with 45.5 parts by weight the following mechanical pro		25
30	Tensile strength I Elongation at break I	DIN 53420 DIN 53571 DIN 53571 DIN 53577 STM D 1692-67 T ge value	(kg/m²) 35 (kp/cm²) 0.6 (%) 135 (p/cm²) 20 (cm) 6.0 (sec.) 35 Self-extinguishing.	30
35	tolylene-2,4- and -2,6-diisocya	ne glycol were added to 35. nate mentioned in Example 1	at 60°C and reacted for	35
40	30 minutes, the reaction mixture tion of 0.037 parts of \$\textit{B}_{-}pheny to 130°C and then left at that mixture took place, until the 1 After cooling to 100°C, 3.70	the restriction of the restricti	eaction mixture was heated erisation of the isocyanate in took about 1 to 2 hours. were added and reacted at	
45	the same temperature over a rend of this time had an NCO an 80/20 mixture of tolylenesolution had the following pro 39, refractive index: np. 50: 1.56	value of 23.3%, was then d 2,4- and -2,6-diisocyanate. The perties: NCO content (%):	liluted with 65.06 parts of	45

B) 100 Parts by weight of a polypropylene glycol which had been started on trimethylolpropane and modified with ethylene oxide to result in approximately 60% of primary phydroxyl end groups with OH number 28, 2.6 parts by weight of water, 6.15 parts by weight of endocthylenepiperazine, 0.40 parts by weight of tetramethylerthylendiamine and 2.0 parts by weight of sloxane 3 were mixed together and reacted with 38.8 parts by weight of the polyisocyanate mentioned above.

	A foam resin which h	ad the following mechanical	properties was o	btained:	
	Density	DD1 52420			
		DIN 53420	(kg/m³)	41	
	Tensile strength	DIN 53571	(kp/cm²)	0.6	
_	Elongation at break	DIN 53571	(%)	135	
5	Compression test	DIN 53577	(p/cm ²)	20	5
	Flammability according to				
	Length of burnt sample/av	erage value	(cm)	4.1	
	Average extinction time	•	(sec.)	30	
	Assessment		Self-extinguis		
			our campai		
10		Example 5			10
	A) If the process were can	rried out in the same way as	s is described und	r 7 A) hut	
	2.03 parts of trimethylolog	opane were used instead of	tripropylene glu	ol and the	
	reaction mixture was dilute	d with 66.30 parts of an 80	0/20 mixture of t	olylana 2.4	
	and -2 f-diisocvanate then	the polyisocyanate solution	obtained had th	o following	
15	properties: NCO content (%): 39.0, viscosity cP _{28 deg} (. 60 mofmontime	e lonowing	15
13	1.5682.	70-): 35.0, VISCOSILY CF 28 deg (o: 38, retractive	ndex no	15
	1.5002.				
	B) 100 Parts by weight o	f a polypropylene glycol wh	sich had been eta	ted on tri	
	methyloloropane and modif	ied with ethylene oxide to	recult in approvin	actaln 700/	
	of primary hydroxyl and m	oups with OH number 32.0,	resuit in approxim	iatery 70%	
	or primary nyurozyr chu gi	oups with Ori number 32.0,	,		
20	2.5				
20	2.5 parts by weigh				20
		t of endoethylenepiperazine,			
		t of N,N-dimethyl-benzylam	ine and .		
	1.5 parts by weigh	nt of siloxane 2			
	were mixed together and re	acted with 37.5 parts by weigh	ght of the polyisod	yanate pre-	
25	pared as described above. A	foam resin with the follows	ing mechanical pro	perties was	25
	obtained.				
	_				
	Density	DIN 53420	(kg/m^3)	42	
	Tensile strength	DIN 53571	(kp/cm²)	0.6	
	Elongation at break	DIN 53571	(%) ´	140	
30	Compression test	DIN 53577	(p/cm*)	22	30
	Flammability according to		G//		50
	Length of burnt sample/av		(cm)	4.0	
	Average extinction time	erage value			
	Average extinction time	erage value	(sec.)	40.0	
	Average extinction time Assessment	erage vame		40.0	
25	Average extinction time		(sec.)	40.0	
35	Average extinction time Assessment	Example 6	(sec.)	40.0	35
35	Average extinction time Assessment A) Preparation of polyisoc	Example 6	(sec.) Self-extinguis	40.0 hing.	35
35	A) Preparation of polyisoc 1.54 Parts of 1,2-propy	Example 6 yanate iene glycol were added at 60	(sec.) Self-extinguis °C to 38.46 parts	40.0 hing.	35
35	A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usi	Self-extinguis C to 38.46 parts	40.0 hing.	35
	A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-diisocyanate in a vessel and the mixture was reacted	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usin for 30 minutes. during whi	Self-extinguis °C to 38.46 parts ig nitrogen as pro	40.0 hing.	35
35	A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-diisocyanate in a vessel and the mixture was reacte 100°C without heating from	Example 6 yanate elene glycol were added at 60 equipped with a stirrer, usir for 30 minutes, during whi an external source. After ti	Self-extinguis C to 38.46 parts ag nitrogen as proch time it heated be addition of 0.0	40.0 hing. of tolylene-tective gas, up to 95—60 parts of	35
	A) Preparation of polysico 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel 100°C without heating fron 6-phenyl-chyl-ethyleneimin 6-phenyl-chyl-ethyleneimin	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usi for 30 minutes, during whi an external source. After it the traction mixture was	°C to 38.46 parts ag nitrogen as proch time it heated be addition of 30.00 bested to 30.00 bes	40.0 hing. of tolylene-tective gas, up to 95—60 parts of	٠.
	Average extinction time Assessment A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacte 100°C without heating from β-phenyl-cthyl-ethyl-ethimin left at this temperature unt	Example 6 yanate iene glycol were added at 60 equipped with a stirrer, usin for 30 minutes, during whi an external source. After it the reaction mixture was lafter about 5 to 6 hours.	Self-extinguis °C to 38.46 parts ag nitrogen as pro thine it heated be addition of 0.0 heated to 130°C	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then	٠.
	Average extinction time Assessment A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacte 100°C without heating fron β-phenyl-chyl-enthyl-enthyl-enthyl Irimerisation of the polyiso	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usir for 30 minutes, during with an external source. After ti, the reaction mixture was il, after about 5 to 6 hours, cyvanate was then stopned by	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130°C the NCO value v the Addition of v the vibra division of	40.0 hing. of tolylene-tective gas, up to 95—60 parts of and then was 26.0%.	٠.
	Assessment A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-diisocyanate in a reseal and the mixture was reacte 100°C without heating from β-pheayl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polyiso of methyl-p-obluces subjood of methyl-p-obluces subjood	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usin for 30 minutes, during whi a an external source. After it, the reaction mixture was il, after about 5 to 6 hours, yanate was then stopped b ate, and after cooline to 120	Self-extinguis C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130°C the NCO value to the difficient of 0.0 C the rection r	40.0 hing. of tolylene-tective gas, up to 95—60 parts of and then was 26.0%. 0.038 parts	٠.
	Assessment A) Preparation of polyisoc 1.54 Parts of 1,2-propy 2,4-diisocyanate in a reseal and the mixture was reacte 100°C without heating from β-pheayl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polyiso of methyl-p-obluces subjood of methyl-p-obluces subjood	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usin for 30 minutes, during whi a an external source. After it, the reaction mixture was il, after about 5 to 6 hours, yanate was then stopped b ate, and after cooline to 120	Self-extinguis C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130°C the NCO value to the difficient of 0.0 C the rection r	40.0 hing. of tolylene-tective gas, up to 95—60 parts of and then was 26.0%. 0.038 parts	40
40	Average extinction time Assessment A) Preparation of polyisoc 2.4-dissocyanate in a vessel 100 °C mixture was reacted 100 °C mixture was reacted 100 °C mixture was reacted 100 °C mixture was Pophayl-tuly-lethyleminin left at this temperature unt Trimerisation of the polyiso of methyl-p-tolucne sulphon diluted with 60.0 parts of diluted with 60.0 parts of	yanate Example 6 yanate eleme glycol were added at 60 erne glycol with a stirrer, usin for 30 miautes, during whi an external source. After it and external source. After it between the source it and after cooling to 120 and 80/20 mixture of tolyler.	°C to 38.46 parts ag nitrogen as proch time it heated to 130°C the NCO value by the addition of 9°C, the reaction in 10°C, the 1	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%.	٠.
40	Average extinction time Assessment A) Preparation of polysice 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacte 100°C without heating from 3-phenyl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polysic Trimerisation of the polysic diluted with 60.0 parts of The polysico-yearate had the	yanate Example 6 Jene glycol were added at 60 equipped with a stirrer, usif for 30 minutes, during whi an external source. After ti , the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by asse, and after cooling to 120 state, and after cooling to 120 following properties: NCO1 following properties: NCO1 following properties: NCO1	°C to 38.46 parts ag nitrogen as proch time it heated to 130°C the NCO value by the addition of 9°C, the reaction in 10°C, the 1	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%.	40
40	Average extinction time Assessment A) Preparation of polyisoc 2.4-dissocyanate in a vessel 100 °C mixture was reacted 100 °C mixture was reacted 100 °C mixture was reacted 100 °C mixture was Pophayl-tuly-lethyleminin left at this temperature unt Trimerisation of the polyiso of methyl-p-tolucne sulphon diluted with 60.0 parts of diluted with 60.0 parts of	yanate Example 6 Jene glycol were added at 60 equipped with a stirrer, usif for 30 minutes, during whi an external source. After ti , the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by asse, and after cooling to 120 state, and after cooling to 120 following properties: NCO1 following properties: NCO1 following properties: NCO1	°C to 38.46 parts ag nitrogen as proch time it heated to 130°C the NCO value by the addition of 9°C, the reaction in 10°C, the 1	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%.	40
40	Average extinction time Assessment A) Preparation of polysice 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacte 100°C without heating from 3-phenyl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polysic Trimerisation of the polysic diluted with 60.0 parts of The polysico-yearate had the	yanate Example 6 Jene glycol were added at 60 equipped with a stirrer, usif for 30 minutes, during whi an external source. After ti , the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by asse, and after cooling to 120 state, and after cooling to 120 following properties: NCO1 following properties: NCO1 following properties: NCO1	°C to 38.46 parts ag nitrogen as proch time it heated to 130°C the NCO value by the addition of 9°C, the reaction in 10°C, the 1	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%.	40
40	Average extinction time Assessment A) Preparation of polyisoc. 1.54 Parts of 1,2-propy 2,4-diisocyanate in a vessel and the mixture was reacted. 100°C without heating from 8-pheayl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polyiso of methyl-p-tolucne sulphon diluted with 60.0 parts of The polyisocyanate had the CF2_segs: 0.58, refractive in the property of the polyisocyanate had the CF2_segs: 0.58, refractive in the property of	yanate free glycol were added at 60 equipped with a stirrer, nair for 30 minutes, during with an external source. After to, the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by ate, and after cooling to 120 an 80/20 mixture of tolyler following properties: NCO cless np.*2: 1.5721. a polyroproplene glycol which	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as proch time it heated be addition of the NCO value the NCO v	40.0 hing. of tolylene-tective gas, up to 95—60 parts of and then was 26.0%. 0.038 parts iisocyanate. w, viscosity	40
40	All Preparation of polyisoc. A) Preparation of polyisoc. 1.54 Parts of 1,2-propy 2,4-disocynance in a vessel and the mixture was reacted 100°C without heating from β-phenyl-ethyl-ethyleneimin left at this temperature untrimerisation of the polyisoc of methyl-p-tolione sulphon diluted with 0.0.0 parts of The polyisocynanate had the cf-2 sec: 63, refractive in the cf-2 sec: 64,	Example 6 yanate eleme glycol were added at 60 eme glycol were added at 60 equipped with a stirrer, usin for 30 minutes, during whit a an external source. After it, the reaction mixture was 1, after about 5 to 6 hours, cyanate was then stopped by a for 20 mixture of tolyler following properties: NCO c lex n ₀ .": 1.5721. a polypropylene glycol which with the property of the polylene glycol which wither povide m such in 60	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130°C the NCO value ty C the reaction r ie-2,4 and -2,6-d content (%): 39.44°C had been selected to 40°C of progresses be	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then vas 26.0%. 0.038 parts silsocyanate. %, viscosity	40
40 45	All Preparation of polyisoc. A) Preparation of polyisoc. 1.54 Parts of 1,2-propy 2,4-disocynance in a vessel and the mixture was reacted 100°C without heating from β-phenyl-ethyl-ethyleneimin left at this temperature untrimerisation of the polyisoc of methyl-p-tolione sulphon diluted with 0.0.0 parts of The polyisocynanate had the cf-2 sec: 63, refractive in the cf-2 sec: 64,	Example 6 yanate eleme glycol were added at 60 eme glycol were added at 60 equipped with a stirrer, usin for 30 minutes, during whit a an external source. After it, the reaction mixture was 1, after about 5 to 6 hours, cyanate was then stopped by a for 20 mixture of tolyler following properties: NCO c lex n ₀ .": 1.5721. a polypropylene glycol which with the property of the polylene glycol which wither povide m such in 60	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130°C the NCO value ty C the reaction r ie-2,4 and -2,6-d content (%): 39.44°C had been selected to 40°C of progresses be	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then vas 26.0%. 0.038 parts silsocyanate. %, viscosity	40
40	Average extinction time Assessment A) Preparation of polyisoc. 1.54 Parts of 1,2,propp 2,4—disocyanate in a vesel and the mixture was resete 100°C without heating from 3-pheayl-ethyl-ethyleneimin left at this temperature unt Trimerisation of the polyiso of methyl-p-tolucane sulphon ditured with 60.0 parts of The polyisocyanate had the CF2,268°C iS, refractive in B) 100 Parts by weight of tiol and modified with eth groups with OH number 3	grante grante lene glycol were added at 60 equipped with a stirrer, air for 30 minutes, during whi am external source. After to, the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by ate, and after cooling to 120 an 80/20 mixture of tolyler following properties: NCO clear np.**: 150 cm. p.* a polypropylene glycol which ylene oxide to result in 60 s. 2.5 parts by weight of the state of th	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as proch time it heated be addition of the observation of the NCO value the	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%. on the was 26.0%. yiscosity with the control of the control o	40
40 45	All Preparation of polyisoc. A) Preparation of polyisoc. 1.45 Parts of 1,2-propy 2,4-disocynante in a vessel and the mixture was reacted 100°C without heating from β-phenyl-ethyl-ethyleneimin left at this temperature untransaction of the polyisocynante had the CP _{2,2} sec. 63, refractive in CP _{2,3} sec. 63, refractive in the distribution of the polyisocynante had the CP _{2,3} sec. 63, refractive in the distribution of th	Example 6 yanate lene glycol were added at 60 eme glycol were added at 60 equipped with a stirrer, usir for 30 minutes, during whi a an external source. After it an external source. After it and the reaction mixture was it, after about 5 to 6 hours, cyanate was then stopped by stee, and after cooling to 120 m 80/20 mixture of tolyler following properties: NOC oc tex no.": 1.5721. a polypropylene glycol which yelme oxide to result in 60 5, 2.5 parts by weight of v parts by weight of triefylange.	(sec.) Self-extinguis *C to 38.46 parts ag nitrogen as pro ch time it heated be addition of 0.0 heated to 130** the NCO value v the NCO value v the NCO value to the Content (sec.) and addition of the Addition of the Self-extended the Addition of the Self-extended the Self-extended the Addition of the Self-extended the Addition of the Self-extended th	40.0 hing. of tolylene-tective gas, up to 95—60 parts of 2 and then was 26.0%. 0.038 parts inkture was iissocyanate. %, viscosity on hexane-droxyl end weight of weight of weight of	40
40 45	Average extinction time Assessment A) Preparation of polyisec. 1.54 Parts of 1,2-propy 2,4-disocyanate in a and the mixture was reacted. 100°C without heating from 3-phenyl-chlyle-ethyleneimn left at this temperature unt 7-imerisation of the polyis of methyl-p-tolucane sulphon diluted with 6.0, parts of The polyisocyanate had the CF2 aee C: 63, refractive in B) 100 Parts by weight of tiol and modified with eth groups with OH number 3 endocthylenepiperazine, 0,4 tetramethylethylene diamine	granate granate granate granate lene glycol were added at 60 equipped with a stirrer, usin equipped with a stirrer, usin granate and a stirrer, usin an external source. After t , the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by ate, and after cooling to 120 an 80/20 mixture of tolyler following properties: NCO c lets n ₀ **: 1.5721. a polypropylene glycol which tylene oxide to result in 60 parts by weight of teichyla parts by weight of circhyla and 10 nat the weight of 81	(sec.) Self-extinguis C to 38.46 parts ag nifrogen as pro the control of the control beated to 130° the NCO value y the addition of "C, the reaction n e-2,4- and -2,6-d content (%): 39.4° a had been started % of primary by water, 0,1 part by taken, 0,2 parts by authorized the control self-extended the control self-extinguish self-e	40.0 hing. of tolylene-tective gas, up to 95—60 parts of: and then was 26.0%, 0.038 parts nisture was iiisocyanate. %, viscosity on hexane-droxyl end weight of weight of weight of	40
40 45	Average extinction time Assessment A) Preparation of polysice. 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacted 100°C without heating from 3-phenyl-ethyl-ethylenenims left at this temperature unt Trimerisation of the polysic of	Example 6 yanate lene glycol were added at 60 equipped with a stirrer, usir for 30 minutes, during whi an external source. After ti , the reaction mixture was il, after about 5 to 6 hours, evyanate was then stopped by evyanate was then stopped to compare to the stopped to compare	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as prochem to time it head be addition of 0.0 heated to 130° the NCO value v the addition of 1°C, the reaction in experiment (%): 39.4° at had been started % of primary by avater, 0.1 part by miles.	40.0 hing. of tolylene- tective gas, up to 95— 2 and then years of 2 2 and then years 26.0%. 0.038 parts intrute was instrute was instrute was instruce was instruced weight of weight of weight of ed together is of secretived.	40
40 45	Average extinction time Assessment A) Preparation of polysice. 1.54 Parts of 1,2-propy 2,4-disocyanate in a vessel and the mixture was reacted 100°C without heating from 3-phenyl-ethyl-ethylenenims left at this temperature unt Trimerisation of the polysic of	granate granate granate granate lene glycol were added at 60 equipped with a stirrer, usin equipped with a stirrer, usin granate and a stirrer, usin an external source. After t , the reaction mixture was il, after about 5 to 6 hours, cyanate was then stopped by ate, and after cooling to 120 an 80/20 mixture of tolyler following properties: NCO c lets n ₀ **: 1.5721. a polypropylene glycol which tylene oxide to result in 60 parts by weight of teichyla parts by weight of circhyla and 10 nat the weight of 81	(sec.) Self-extinguis C to 38.46 parts ag nitrogen as prochem to time it head be addition of 0.0 heated to 130° the NCO value v the addition of 1°C, the reaction in experiment (%): 39.4° at had been started % of primary by avater, 0.1 part by miles.	40.0 hing. of tolylene- tective gas, up to 95— 2 and then years of 2 2 and then years 26.0%. 0.038 parts intrute was instrute was instrute was instruce was instruced weight of weight of weight of ed together is of secretived.	40

10		1,561,571			10
5	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/ave Average extinction time Assessment	DIN 53420 DIN 53571 DIN 53571 DIN 53577 ASTM D 1692-67 T crage value	(kg/m³) (kp/cm²) (%) (p/cm²) (cm) (sec.) Self-extinguishi	42 0.6 130 22 4.0 45.0	5
10	with acctone) and 0.058 pa	Example 7 risocyanate n of water in acetone (25 g of rts of \$\beta\$-phenyl-ethyl-ethylener anate at 25°C. The slightly of	mine were added	to 38.76	10
15	2 hours when the NCO val part of benzovl chloride.	a brief incubation period an ue had reached 31.0 to 31.3% was then heated to 80°C and	d was stopped at , by the addition	fter about of 0.042	15
20	giycol were added over a pt to 95—100°C. Stirring was the reaction mixture was th and -2,6-diisocyanate (80:2 polyisocyanate in tolylene o	riod of 10 to 15 minutes, the continued for one hour without on diluted with 58.91 parts of 20% by weight). The solution diisocyanate had the following the c: 54, refractive index no.	reaction temperate out further heat so a mixture of tol n of modified iso properties: NC	ure rising upply and ylene-2,4-	20
25	methylolpropane and modifi- hydroxyl end groups with 6 by weight of endoethylener parts by weight of siloxane	of a polypropylene glycol whith fied with ethylene oxide to re OH number 35.0, 2.5 parts by oiperazine, 0.8 parts by weigh 2 were mixed together and	esult in 60% of weight of water t of triethylamine reacted with 37.5	primary , 0.1 part and 2.0 parts by	25
30	weight of the polyisocyanate anical properties was obtain	mentioned above. A foam resided:	n with the follow	ing mech-	30
35 35	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/av Average extinction time Assessment	erage value	(kg/m³) (kp/cm²) (%) (p/cm²) (cm) (sec.) Self-extinguishi	43 0.6 135 25 4.0 42.0 ing.	35
40	A) Preparation of the polyis	Example 8 socyanate			40
45	and the mixture was reacte	opropanol were added to 95 scribed in Example 4 in toly d at this temperature for 2 hollowing properties: NCO co dex n_D^{20} : 1.5858.	ylene diisocyanate ours. The resultin	at 90°C	45
50	giyeerol and modified with groups with OH number 3: endoethylenepiperazine, 0.5 parts by weight of siloxane weight of the polyisocyanate	of a polypropylene glycol v ethylene oxide to result in 60°5 5.0, 2.5 parts by weight of weight parts by weight of tetrameth 3 were mixed together and; prepared as described above. following mechanical properts	% of primary hydrogen ster, 0.1 part by yl-ethylenediamine reacted with 37.5	roxyl end weight of and 1.8 parts by	50
55	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/av	ASTM D 1692-67 T	(kg/m²) (kp/cm²) (%) (p/cm²) (cm)	43 0.7 130 22 3.0	55
60	Average extinction time Assessment		(sec.) Self-extinguishi	25.0 ing.	60

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Example 9 A) Preparation of the polyisocyanate

20 Parts of 1,2-propylene glycol were added at 60°C to a mixture of 225 parts of a mixture of 80% by weight of tolylene-2,4-diisocyanate and 20% by weight of tolylene-2,6-diisocyanate and 275 parts of diphenylmethane-4,4'-diisocyanate and 275 parts of diphenylmethane-4,4'-diisocyanate and 275 parts of a part of a part of the party of the par 5 reacted for 30 minutes. After the addition of 1 part of β -phenyl-ethyleneimine, the reaction mixture was heated to 130°C. The trimerisation which took place at this temperature was stopped after 21 hours, when the NCO content of the reaction mixture was 26.5%, by adding 1 part of methyltoluenesulphonate. After dilution with 624 parts of an 80/20 mixture of tolylene-2,4- and -2,6-diisocyanate, a polyisocyanate 10

solution which had the following properties was obtained: NCO content (%): 38.4, viscosity cP₂₅ deg C: 24, refractive index n_D⁵⁰: 1.5738.

B) 100.0 Parts by weight of a polypropylene glycol which had been started on sorbitol and modified with ethylene oxide to result in more than 10% of primary hydroxyl end groups with OH number 35, 2.5 parts by weight of water, 0.1 part by weight of endoethylenepiperazine, 0.3 parts by weight of N,N-dimethyl-benzylamine and 2.0 parts by weight of siloxane I were mixed together and reacted with 34.5 parts by weight of the polyisocyanate mentioned above.

A foam resin with the following mechanical properties was obtained:

20	Tensile strength DIN Elongation at break DIN Compression test DIN Flammability according to AST	N 53420 N 53571 N 53571 N 53577 FM D 1692-67 T	(kg/m³) (kp/cm²) (%) (p/cm²)	45 0.5 160 20
25	Length of burnt sample/average Average extinction time Assessment		(cm) (sec.) Self-extinguishin	4.5 42.0 g.

Example 10

 A) Preparation of the polyisocyanate 1.54 Parts of 1,2-propylene glyrol were added to 38.46 parts of tolylene-2,4-discoyanate at 60°C in a ressel equipped with stirrer, using nitrogen as protective gas, and the mixture was reacted for 30 minutes, during which time it heated up to 95—100°C without heating from an external source. After the addition of 0.060 30 35

parts of β -phenyl-ethyl-ethyl-enemine, the reaction mixture was heated to 130°C and left at this temperature until, after about 5 to 6 hours, the NCO value is 26.0%. Trimerisation of polyisocyanate was then stopped by the addition of 0.038 parts of methyl p-toluene sulphonate and after cooling the reaction mixture to 120°C it was diluted with 60.0 parts of an 80/20 mixture of tolylene-2,4- and -2,6-diisocyanate. The reaction mixture had the following properties: NCO content (%): 39.4, viscosity CF_{3.00} or c. 6.3, refractive index: n₂.6.* 1.5/721. 40

B) 100 Parts by weight of a polypropylene glycol which had been started on trimethylolpropane and modified with ethylene oxide to result in about 40% of primary hydroxyl end groups with OH number 20, 2.5 parts by weight of water, 0.20 parts by weight of endoethylenepiperazine, 0.3 parts by weight of N,N-dimethyl-benzylof weight of chaotisynchipterature, on parts by weight of 1757-minetary-outsignaming and 1.75 parts by weight of siloxane 1 were mixed together and reacted with 35.0 parts by weight of the polyisocyanate mentioned above.

A foam resin with the following mechanical properties was obtained:

	DIN 53420	(kg/m³)	45	
Tensile strength	DIN 53571		43	
Elongation at break		(kp/cm-)		
Compression test				50
Flammability according	to ASTM D 1602 C7 T	(p/cm²)	25	
I enoth of hurst comple	W 131M D 1692-6/ 1			
Arrens or built sample/	average value	(cm)	5.0	
		(sec.)	30.0	
Assessment		Self-extinguis	shing	55
	Density Tensile strength Elongation at break Compression test Flammability according Length of burnt sample/ Average extinction time Assessment	Tensilé strength DIN 53571 Elongation at break DIN 53571 Compression test DIN 53577 Flammability according to ASTM D 1692-67 T Length of burnt sample/average value Average extinction time	Tensile strength	Tensile strength

Example 11

100 Parts by weight of a polypropylene glycol which had been started on di-propylene glycol and modified with ethylene oxide to result in 60% of primary hydroxyl end groups with OH number 28, 3.5 parts by weight of water, 0.1 part by

5	by weight of siloxane 1 wer of a polyisocyanate containing by reacting a mixture of toly by weight) and water (NCO	izine, 0.6 parts by weight of tre mixed together and reacted v g biuret groups, which polyisoco- leine-2,4- and -2,6-diisocyanate content 38.5%). following mechanical properties	with 45.5 parts by cyanate had been pro (ratio of isomers 65	weight epared
10	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/ave Average extinction time Assessment		(kp/cm²) (%) 1	35 0.6 50 25 10 6.0 50.0
15	hydroxydiphenylmethane and 60% of primary OH end g	Example 12 f a polypropylene glycol which i modified with ethylene oxide roups with OH number 28, 3.5	to result in approx parts by weight of	mately water,
20	0.1 part by weight of ende and 1.2 parts by weight of parts by weight of a biure mixture of toluene-2,4- and	oethylenepiperazine, 0.6 parts to siloxane 1 were mixed toget to polyisocyanate which had be 1-2,6-diisocyanate (ratio of iso 18.5%). A foam resin with the	by weight of triethy her and reacted wi en prepared by rea omers 80:20% by	rlamine th 45.5 20 cting a weight)
25	Density Tensile strength Elongation at break Compression test	DIN 53420 DIN 53571 DIN 53571 DIN 53577	(kg/m²) (kp/cm²) (%) (p/cm²)	35 25 0.7 160 23
30	Flammability according to Length of burnt sample/at Average extinction time Assessment	erage value	(cm) (sec.) Self-extinguishing	5.7 30 47.0 :
35	methylolpropane and modi of primary hydroxyl end g 0.1 part by weight of end- phosphate and 1.0 part by	Example 13 of a polypropylene glycol whice from with ethylene oxide to re- troups with OH number 20, 3.5 oethylenepiperazine, 5.0 parts be- weight of siloxane 1 were mixe- intert polyisocyanate which had	sult in approximate i parts by weight on y weight of trichlo d together and react	ly 60% 35 f water, roethyl- ed with
40	tolylene-2,4-diisocyanate wi	th water (NCO content 38.5% following mechanical properti).	40
45	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/a Average extinction time Assessment		(kg/m²) (kp/cm²) (%) (p/cm²) (cm) (sec.) Self-extinguishin	37 0.6 140 23 45 3.0 25.0 3.
50	methylolpropane and mod of primary hydroxyl end a	Example 14 of a polypropylene glycol which ified with ethylene oxide to re- groups with OH number 32, 2.2	sult in approximate 5 parts by weight o	ly 70% f water,
55	0.1 part by weight of end benzylamine and 2.5 parts	oethylenepiperazine, 1.0 part b by weight of siloxane 1 were of a biuret polyisocyanate whice	y weight of N,N-d mixed together and	imethyl- reacted 55

13		1,381,571			13
	and water (NCO content	dene-2,4- and -2,6-diisocyans 38.5%). he following mechanical prop			
	Density	DIN 53420			
5	Tensile strength Elongation at break	DIN 53571 DIN 53571	(kg/m³) (kp/cm²) (%)	40 0.7 130	. 5
	Compression test Flammability according	DIN 53577 to ASTM D 1692-67 T	(p/cm²)	25	
10	Length of burnt sample/ Average extinction time Assessment	average value	(cm) (sec.)	7.0 60.0	10
			Self-extinguis	sning.	
		Example 15			
		of a polypropylene glycol vified with ethylene oxide to			
15	0.1 part by weight of end benzylamine and 0.2 part	groups with OH number 48, doethylenepiperazine, 0.3 parts by weight of siloxane 1 we at of a biuret polyisocyanate	, 2.5 parts by weight ts by weight of N,l	ht of water, N-dimethyl-	15
20			ate (ratio of isome	rs 80:20%	
20	by weight) and water (NO A foam resin with th	te following mechanical prop	erties was obtained:		20
	Density Tensile strength	DIN 53420	(kg/m³)	42	
25	Elongation at break	DIN 53571 DIN 53571 DIN 53577	(kp/cm²) (%)	0.7 120	
25	Compression test Flammability according t	o ASTM D 1692-67 T	(p/cm²)	25	25
	Length of burnt sample/s Average extinction time Assessment	verage value	(cm) (sec.) Self-extinguis	6.0 35	-
			Sen-extinguis	ning.	
30		Example 16			30
	with OH number 56, 2.5	of a polypropylene glycol whice e oxide to result in 28% of parts by weight of water, 0 t by weight of pentamethyld	20 parts by weigh	end groups t of endo-	30
35	of a biuret polyisocyanate 2,4- and -2,6-diisocyanate	which had been prepared by (ratio of isomer 65:35%)	ted with 42.0 parts	by weight	3 5
		following mechanical prope		(
40	Density	DIN 53420	(kg/m³)	45	40
	Tensile strength Elongation at break	DIN 53571 DIN 53571	(kp/cm²)	0.7	40
	Compression test	DIN 53577	(%) (p/cm²)	120 30	
45	Flammability according to Length of burnt sample/a	Verage value	(cm)		
	Average extinction time Assessment	-	(sec.)	4.0 38	45
			Self-extinguish	ing.	
		Example 17			
50	and modified with ethylen	f a polypropylene glycol which coxide to result in 60% of	h had been started o	on glycerol	F 0
	of siloxane 3 were mixed	arts by weight of water, 0.1 pright of tetramethylethylenedia ogether and reacted with 38. eeen prepared by reacting a	mine and 1.2 parts	by weight	50

A foam resin with the following mechanical properties was obtained:

5	Density Tensile strength Elongation at break Compression test Flammability according to Length of burnt sample/av Average extinction time Assessment		(kg/m²) (kp/cm²) (%) (p/cm²) (cm) (sec.) Self-extinguish	40 0.7 130 30 3.5 42 ing.	5
10		Example 18			10
15	and modified with ethylene end groups with OH numbe endoethylenepiperazine, 1.0 butane-1,4-diol and 1.0 pa by weight of a biuret polyit of tolylene-2,4- and -2,6-d water (NCO content 38.5%	a polypropylene glycol which I scride to result in approximately cr 48, 2.5 parts by weight of w part by weight of trierbylami t by weight of siloxane I w socyanate which had been prep lisocyanate (ratio of isomers 8 5). following mechanical properties	of 60% of primary ater, 0.1 part by ne, 1.5 parts by the reacted with ared by reacting 0 to 20% by w	weight of weight of weight of 40.5 parts a mixture	15
20	Density	DIN 53420	(kg/m³)	48	20
	Tensile strength Elongation at break Compression test Flammability according to	DIN 53571 DIN 53571 DIN 53577	(kp/cm²) (%) (p/cm²)	0.9 130 28	
25	Length of burnt sample/av	verage value	(cm) (sec.)	3.5 35	25
	Average extinction time Assessment		Self-extinguish		
30 35	propylene glycol and modi of primary hydroxyl end g 0.1 part by weight of en ethylenediamine, 1.5 part of siloxane 2 were reacted had been prepared by reac of isomers 80:20% by we	Example 19 of a polypropylene glycol whit ified with ethylene oxide to re roups with OH number 28, 2. doethylenepiperazine, 0.5 parts by weight of tripropylene glyc with 41.5 parts by weight of a ting a mixture of tolylene-24- ight and water (NCO content e following mechanical properti	sult in approxim 5 parts by weigh by weight of to ol and 2.0 parts biuret polyisocya and -2,6-diisocya 38.5%).	ately 60% t of water, etramethyl- by weight nate which	30 35
	Density Tensile strength	DIN 53420 DIN 53571	(kg/m²) (kp/cm²)	45 0.8	
40	Elongation at break Compression test	DIN 53571 DIN 53577	(%) (p/cm²)	120 30	40
	Flammability according to Length of burnt sample/a	o ASTM D 1692-67 T verage value	(cm)	3.7	
45	Average extinction time Assessment		(sec.) Self-extinguis	28 hing.	45
			-		
50	methylolpropane and modi of primary hydroxyl end a 0.1 part by weight of end benzylamine, 1.0 part by w 1 were reacted with 41.5	Example 20 of a polypropylene glycol whis ified with ethylene oxide to re groups with OH number 35, so cethylenepierazine, 1.5 parts i eight of diethyleneglycol and 1. parts by weight of a birurer pol ene-2,4-diisocyanate, and water	sult in approxim 5 parts by weigh by weight of N,N 5 parts by weight yisocyanate which	ately 75%, at of water, V-dimethyl- of siloxane h had been	50

	A foam resin with the	following mechanical properties	s was obtained:		
5		DIN 53420 DIN 53571 DIN 53571	(kg/m³) (kp/cm²) (%)	45 0.9 130	
,	Compression test Flammability according to Length of burnt sample/ave Average extinction time		(p/cm²) (cm) (sec.)	3.5 30.0	5
10	Assessment	Example 21	Self-extinguishir	•	10
15	and modified with ethylene end groups with OH numbe endoethylenepiperazine, 0.8	a polypropylene glycol which hoxide to result in approximately a 30, 2.5 parts by weight of butane-1,4 and 1.8 parts by weight of	7 65% of primary ater, 0.1 part by 1 I-diol. 0.2 parts b	hydroxyl weight of www.weight	15
	acting tolylene-2,4-diisocyan A foam resin with the	f a biuret polyisocyanate which ate and water (NCO content following mechanical propertie	had been prepare 38.5%). s was obtained:	ed by re-	13
20	Density Tensile strength	DIN 53420 DIN 53571	(kg/m³) (kp/cm²)	46 0.7	20
	Tensile strength Elongation at break Compression test Flammability according to	DIN 53571 DIN 53577	(p/cm²)	120 30	20
25	Length of burnt sample/ave Average extinction time	erage value	(cm) (sec.)	4.2 30	0.5
	Assessment		Self-extinguishir		25
	100 Parts by weight of	Example 22 f a polypropylene glycol which	had been starter	d on tri-	
30	of primary hydroxyl end gr 0.2 parts by weight of end and 1.0 part by weight of biuret polyisocyanate which	ed with ethylene oxide to res oups with OH number 35, 3.0 oethylenepiperazine, 1.0 part t siloxane 1 were reacted with had been prepared by reaching	parts by weight parts by weight by weight of triet 48.5 parts by weight of the same of the same and the same of the same are same as mixture of the same are same	ely 60% of water, hylamine ght of a	30
35	(NCO content 30.0%).	ocyanate (ratio of isomers 60:4 following mechanical properties		nd water	35
	Density	DIN 53420	(kg/m²)	42	
	Density Tensile strength Elongation at break Compression test	DIN 53571 DIN 53571	(kp/cm²) (%)	1.0 140	
40	Compression test Flammability according to	DIN 53577	(kp/cm²)	38	40
	Length of burnt sample/ave Average extinction time	erage value	(cm) (sec.)	5.3 · 40	
45	Assessment	Example 23	Self-extinguishin		
	primary hydroxyl end group	of a polypropylene glycol wi ith ethylene oxide to result i s with OH number 35.0, 2.5 ethylenepiperazine, 0.7 parts b	n approximately	60% of	45
50	pholine and 0.20 parts by w 38.0 parts by weight of an trimethylolpropane and tolyl- by weight).	eight of siloxane 1 were mixed isocyanate adduct (NCO con ene-2,4- and -2,6-diisocyanate	together and reac tent 35%) obtain (ratio of isomers	ted with	50
		following mechanical properties	was obtained:		
55		DIN 53420 DIN 53571 DIN 53571 DIN 53577	(kg/m³) (kp/cm²) (%) (p/cm²)	43 0.7 130 25	55
60	Flammability according to	ASTM D 1692-67 T			
00	Length of burnt sample/ave Average extinction time Assessment	rage value	(cm) (sec.) Self-extinguishing	3.5 28	60
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1.381.571 Example 24

	100.0 Parts by weight of a polypropylene glycol which had been started on
	glycerol and modified with ethylene oxide to result in approximately 60% of primary
	hydroxyl end groups with OH number 35.0, 2.5 parts by weight of water, 0.18 parts
5	by weight of endoethylenepiperazine, 0.5 parts by weight of tetramethylethylenedi-
	amine and 3.0 parts by weight of siloxane 1 were mixed together and reacted with
	38.0 parts by weight of an isocyanate adduct (NCO) content (35%) obtained from
	trimethylolpropane and tolylene-2.4- and -2.6-diisocyanate (ratio of isomers 80:20%
	by weight).

10 A foam resin with the following mechanical properties was obtained:

Density Tensile strength Elongation at break Compression test Flammability according	DIN 53420 DIN 53571 DIN 53571 DIN 53577 to ASTM D 1692-67 T	(kg/m³) (kp/cm²) (%) (p/cm²)	44 0.6 120 25	15
Length of burnt sample	:/average value	(cm)	4.0	
Average extinction time		(sec.)	35	
Assessment		Self-extingui	shing.	

Example 25

100.0 Parts by weight of a polypropylene glycol which had been started on tri-methylpropane and modified with ethylene oxide to result in approximately 70% of primary hydroxyl end groups with OH number 32.0, 2.5 parts by weight of water, 0.15 parts by weight of endoethylenepiperaxine, 1.0 part by weight of N₂N-dimethyl-bensylamine and 1.1 parts by weight of silosane 3 were mixed together and reacted with 35.0 parts by weight of an isocynate adduct (NOC content 35%) prepared from trimethylolpropase and tolylene-2,4- and -2,6-diisocynante (ratio of isomers 80:20%

A foam resin with the following mechanical properties was obtained:

30	Density Tensile strength Elongation at break Compression test	DIN 53420 DIN 53571 DIN 53571 DIN 53577	(kg/m²) (kp/cm²) (%) (p/cm²)	44 0.7 135 28	30
35	Flammability according to Length of burnt sample/ave Average extinction time Assessment	erage value	(cm) (sec.) Self-extinguishir	4.5 35 ng.	35

Example 26

100.0 Parts by weight of a polypropylene glycol which had been started on pro-pylene glycol and modified with ethylene oxide to result in approximately 60% of primary hydroxyl end groups with OH number 28, 3.5 parts by weight of water, 0.1 part by weight of endoethyleneniperazine, 3.25 parts by weight of diisopropanolamine and 0.80 parts by weight of siloxane 1 were mixed together and reacted with 55.60 parts by weight of an isocyanate adduct (NCO content 35%) prepared from trimethylolpropane and tolylene-2,4- and -2,6-diisocyanate (ratio of isomers 80:20% by weight).

A foam resin with the following mechanical properties was obtained:

ю	Density Tensile strength Elongation at break Compression test Flammability according	DIN 53420 DIN 53571 DIN 53571 DIN 53577 to ASTM D 1692-67 T	(kg/m³) (kp/cm² (%) (p/cm²)	39 1.1 140 30	50
	Length of burnt sample Average extinction time Assessment	e/average value	(cm) (sec.) Self-extingu	5.7 50 ishing.	

Example 27

100.0 Parts by weight of a polypropylene glycol which had been started on glycorol and modified with ethylene oxide to result in approximately 70% of primary hydroxyl end groups with OH number 32, 2.5 parts by weight of water, 0.2 parts by weight of endoethylenepiperazine, 1.0 part by weight of N,N-dimethylbenzylamine,

5	of an isocvanate adduc	diethylene glycol, 3.0 parts by weight of siloxane 1 were t (NCO content 35%) wh dylene-2,4- and -2,6-diisoc	reacted with 37.5 par	ts by weight	
,	A foam resin with	the following mechanical p	roperties was obtained		5
			- operaco was obtained	-	
	Density Tensile strength	DIN 53420 DIN 53571	(kg/m³)	43	
	Elongation at break	DIN 53571	(kp/cm²)	0.6 135	
10	Compression test	DIN 53577	(p/cm²)	35	10
	Length of burnt sample	to ASTM D 1692-67 T	(cm)		
	Average extinction time	y and go value	(sec.)	3.0 30	
	Assessment		Self-extinguis		
15		Example 28			
	A) 100.0 Parts by w	gight of a polypropylene or	lycol which had been	started on	15
	ary hydroxyl end group parts by weight of endo	s with OH number 35.0, 2	It in approximately 60 .5 parts by weight of	% of prim- water, 0.15	
20		of siloxane 3 were mixed too mate polyisocyanate (NCO		40.0 parts	20
	B) Preparation of the po	luienomanata			
	134 Parts of trimet	violutonane were added on	er a period of about	one hour to	
25					
	methylolpropane, the rea	ction mixture heated up to	114°C When the M	of the tri-	25
	perature for 20 hours. T	he resulting product was a	to 150°C and left a	t this tem-	
30	reocyanace in a mixture of	f tolylene diisocyanate isome	rs, NCO content 38.1	anate poly-	30
					50
		bromopropanol-1 were adde 2½ hours at 90°C. The mo			
35				35.1%, a	
		and a solids content of 4 he following mechanical pro-			- 35
			operacs was obtained:		
	Density Tensile strength	DIN 53420 DIN 53571	(kg/m³)	50	
	Elongation at break	DIN 53571	(kp/cm²)	0.8 120	
40	Compression test	DIN 53577	(p/cm²)	35	40
	Length of burnt sample,	to ASTM D 1692-67 T	(cm)		
	Average extinction time		(sec.)	3.0 25	
	Assessment		Self-extinguish		
45		Example 29			45
	A) 100.0 Parts by weig	the of a natural and the	col which had been	started on	45
	groups with OH number	35.0. 2.5 ports by mainte	n 60% of primary hy	droxyl end	
	endoethylenepiperazine, 0	.5 parts by weight of tetr	or water, 0.1 part by	weight of	
50	part by weight of siloxar weight of an allophanate	5.5 parts by weight of tetr 1.5 parts by weight of tetr 1.6 2 were mixed together 1.7 polyisocyanate (NCO cont	and reacted with 40.0 ent 35.1%).	parts by	50
	B) Preparation of the pol-	yisocyanate			
	134 Parts of trimeth	nyloipropane were added ov	ver a period of about	one hour	
55	had been introduced into heated up to 114°C. Whe pletion of the addition of	a reaction vessel and heated in the NCO content reached of trimethylologopape, the	to 80°C. The reaction 41.3%, immediately	20) which on mixture after com-	55
	150°C and left at this ten	perature for 20 hours. The	resulting product was	a solution	

	. 18	1,381,571	₹±18
	5	of an allophanate polyisocyanate in a mixture of tolylene diisocyanate isomers w an NGO content of 38.1%, and a viscosity of 77 CP _{2.846} Co. 100 Parts of 23-dibromopropanol-1 were added to 1900 parts of this solution 80°C and reacted for 2½ hours at 90°C. The modified allophanate polyisocyanate mixture of tolylene diisocyanate isomers had an NOO content of 35.1%, a viscos of 118 CP _{2.847} c and a solids content of 41%. A foam resin with the following mechanical properties was obtained:	at in
	10	Density DIN 53420 (kg/m²) 50	10
	15	Length of burnt sample/average value (cm) 3. Average extinction time (sec.) 28 Assessment Self-extinguishing.	_ 15
-	20	A) 100.0 Parts by weight of a polypropylene glycol which had been started on methylolpropane and modified with ethylene oxide to result in approximately 6 primary hydroxyl end groups with OH number 3, 2.5 parts by weight of dimethylben amine and 1.0 part by weight of slionane 1 were mixed together and reacted 38.0 parts by weight of allophante polysocyante (XCC cuttent 35.1%).	0% iter, zyl- 20
	25	B) Preparation of the polyisocyanate were added over a period of about one hou 134 Parts of transthylolpropase were added over a period of about one hou a management of the period of the period of the period of the period over the period of the period over the period over the period of the period over the period o	had 25 teat- tely
	30	to 150°C and kept at this temperature for 20 hours. The resulting product we solution of an allophanate polysocyanate in a mixture of tolylene diisocyanate mers, NCO content 38.1%, viscosity 77 cP _{17, 547} O A foam resin with the following mechanical properties was obtained:	as a
	35	Elongation at break DIN 53571 - (%) 120 Compression test DIN 53577 (p/cm²) 35 Flammability according to ASTM D 1692-67 T	.8 35
	40	Length of burnt sample/average value (cm) 4 Average extinction time (sec.) Assessment Self-extinguishing.	.0 40
	45	A) 100.0 Parts by weight of a polypropylene glycol which had been started on propylene glycol and modified with ethylene oxide to result in 60% of prin hydroxyl end groups with OM number 280, 25 parts by weight of water, 0.1 by weight of endecthylenepiperazine, 0.4 parts by weight of N-ethylmorpholine, parts by weight of silozane 1 were m together and reacted with 37.0 parts by weight of silozane 1 were m together and reacted with 37.0 parts by weight of an allophanate polyisocyanate (N content 35.1%).	part 0.4 45 ixed
	50	B) Preparation of the polyisocyanate 134 Parts of trimethylolpropane were added over a period of about one hos a mixture of tolylene-24, and -2,6-diisocyanate (ratio of isomers 80:20) which been heated to 80°C, the reaction mixture heating up to 114°C. When the NCO tent reached a value of 41.3%, immediately after completion of the addition of	had con- tri-
	. 55 :	methylolpropane, the reaction mixture was heated to 150°C and left at this temp ture for 20 hours. The resulting product was a solution of an allophanate pol- cyanate in a mixture of tolylene diisocyanate isomers, NCO content 38.1%, visc 77 eP ₂ «t ₂ visc of 2,3-dibromopropanol-1 were added to 1900 parts of 5 this solution 80°C and reacted for 24 hours at 90°C, The modified allophanate polylesocyana	pera- yiso- 55 osity

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the mixture of tolylene diisocyanate isomers had an NCO content of 35.1%, a viscosity of 118 cP $_{2s~deg~C}$ and a solids content of 41%.

A foam resin with the following mechanical properties was obtained:

	Density Tensile strength Elongation at break	DIN 53420 DIN 53571 DIN 53571	(kg/m³) (kp/cm²) (%)	42 0.7 130	5
	Compression test Flammability according	DIN 53577 to ASTM D 1692-67 T	(p/cm²)	30	
Length of burnt samp Average extinction tim Assessment	/average value	(cm) (sec.) Self-extingui	4.4 30 shing.	. 10	
				-	

Example 32

100 Parts by weight of a polypropylene glycol which had been started on trimethylolpropane and modified with ethylene oxide to result in approximately 60%
of primary hydroxyl end groups with OH number 35, 3.0 parts by weight of water, 15 0.2 parts by weight of endocthylenepiperazine, 0.2 parts by weight of tetramethylenediamine, 5.0 parts by weight of trichloroethylphosphate and 1.0 part by weight etayleneamming, 3.0 parts by weight of technicoeursypnospante ann 1.0 part by weight of silozane 1 were mixed together and reacted with 40.5 parts by weight of a mixture consisting of 60 parts by weight of tolylene-2,4- and -2,6-diisocyanate (ratio of isomer 65:35) and 40 parts by weight of a polyphenylpolymethylene polyisocyanate (NCO 20 content 31%).

A foam resin with the following mechanical properties was obtained:

25	Tensile strength D Elongation at break D Compression test D Flammability according to AS	OIN 53420 OIN 53571 OIN 53571 OIN 53577 OTM D 1692-67 T	(kg/m³) (kp/cm²) (%) (p/cm²)	35 0.5 90 18	25
30	Length of burnt sample/average Average extinction time Assessment	e value	(cm) (sec.)	4.9 35	20
30	Assessment	**	Salf antinomist		

WHAT WE CLAIM IS: -

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1. A process for the production of an open-celled flame-resistant foam resin which contains urethane groups, from a polyether which contains active hydrogen atoms, a polyisocyanate, water and/or an organic blowing agent in the presence of a 35 silicon compound, in which the silicon compound is a siloxane of the general formula

in which R represents an aliphatic hydrocarbon radical, R' represents a monovalent aromatic radical and a represents 0 or an integer of from 1 to 3, at least 70% by weight of the siloxane mixture consisting of siloxanes in which a=1 while siloxanes weight of the smoother mixture consisting of smoothers in which a -1 while should be in which a -2, a -2 and a -3 are present in the mixture in proportions of not more than 25% by weight, 20% by weight and 5% by weight, respectively.

2. A process as claimed in claim 1 in which between 0.1 and 25% by weight

of the siloxane, based on the quantity of foam resin, is used

3. A process as claimed in claim 2 in which between 0.20 to 5% by weight of the siloxane is used. 4. A process as claimed in any of claims 1 to 3 in which, in the general formula of claim 1, R represents an aliphatic hydrocarbon radical which contains less than 3 carbon atoms.

5. A process as claimed in claim 4 in which, in the general formula of claim 1. R represents a methyl group.

A process as claimed in any of claims 1 to 5 in which, in the general formula
of claim 1, R' represents a phenyl radical.

 A process as claimed in any of claims 1 to 6 in which the polyisocyanate is tolylene-2,4-diisocyanate, tolylene-2,6-diisocyanate or any mixture of these isomers.

 A process as claimed in any of claims 1 to 6 in which the polyisocyanate is a polyphenyl-loop)mentylene-polyisocyanate which has been obtained by anilineformaldehyde condensation followed by phosgenation.

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 A process as claimed in any of claims 1 to 6 in which the polyisocyanate is a solution of a polyisocyanate containing biuret, allophanate, urethane or isocyanurate trums in a polyisocyanate which is free from each groups.

10 groups in a polysicovanate which is free from such groups.
10. A process as claimed in claim 9 in which the polysocyanate solution contains from 5 to 85% by weight of polysicocyanates containing bituret, allophanate,

urethane or isocyanurate groups, based on the total quantity of isocyanate present.

11. A process as claimed in claim 10 in which the polyisocyanate solution contains from 10 to 50% by weight of polyisocyanates which contain bitret, allophanate, urethane or isocyanurate rouns.

urethane or isocyanurate groups.

12. A process as claimed in claim 10 or claim 11 in which the polyisocyanate solution is a solution of a biuret group containing polyisocyanate of the following general formula:

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in which R represents an alkylene, cycloalkylene, aralkylene or arylene radical and X represents hydrogen or the group

in which R has the meaning indicated above and n represents 0 or an integer, in a polyisocyanate which is free from bitter groups.

13. A process as claimed in claim 12 in which, in the general formula of claim

13. A process as claimed in claim 12 in which, in the general formula of claim 12, R represents a C, to C₁₀ alkylene, C₂ to C₁₀ cycloalkylene, C, to C₁₁ aralkylene or C₄ to C₁₀ arylene radical.
14. A process as claimed in claim 12 or claim 13 in which n represents 0 or an

integer of from 1 to 5.

15. A process as claimed in any of claims 12 to 14 in which the proportion of bitter polysocytanets which contain more than 3 isocytante groups, based on the

total quantity of polybinert isocyanates is at least 20% by weight.

16. A process as claimed in any of claims 1 to 15 in which the polyisocyanate contains up to 20% by weight of monofunctional isocyanate.

17. A process as claimed in any of claims 1 to 16 in which the polyisocyanate

contains from 0.3 to 5% by weight of chemically bound emulsifiers.

18. A process as claimed in claim 17 in which the polyisocyanate contains from

0.1 to 2% by weight of chemically bound emulsifiers.

 19. A process as claimed in claim 17 or claim 18 in which the emulsifier contains—OH, amino, amido,—COOH,—SH or unethane groups and is incorporated in the polysicoccurate the treation with the increasing process.

in the polyisocyanate by reaction with the isocyanate groups.

20. A process as claimed in any of claims 1 to 19 in which the polyether has a molecular weight of between 750 and 10,000.

45 21. A process as claimed in any of claims 1 to 20 in which at least 10% of the hydroxyl groups of the polyether are primary hydroxyl groups.
22. A process as claimed in claim 20 or claim 21 in which the high molecular weight polyether is used in admixture with low molecular weight compounds which contain active hydrogen atoms.

contain active hydrogen atoms.

23. A process as claimed in claim 22 in which the low molecular weight compound is a hydroxyl compound.

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24. A process as claimed in any of claims 1 to 21 in which the polyether is used in admixture with up to 50% by weightbased on the polyether, of other high molecular weight compounds which contain active hydrogen atoms.

		2.
	25. A process as claimed in claim 24 in which the polyether is mixed with a polyester, polyacetal, polyester amide or polycarbonate. 26. A process as claimed in any of claims 1 to 25 in which the foam resin is	
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,	27. A process as claimed in any of claims 1 to 26 in which the reaction mixture contains a catalyst for the production of a fourn resin which contains urethane groups. 28. A process as claimed in claim 27 in which the catalyst is a tertiary amine and or a claim and	5
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10	29. A process as claimed in any of claims 1 to 28 in which the reaction mixture also contains an additive for regulating the cell structure, an inorganic or organic filler, a dye or a plasticiser.	10
	30. A process for the production of a flame-resistant foam-resin substantially as	
15	of claims I to 30.	15
	32. A resin as claimed in claim 31 which is a sold band.	

sar as claimed in claim 31 which is a cold hardening foam

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Printed for Her Majesty's Stationery Office, by the Courier Press, Learnington Spa, 1975.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.